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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte AART ZEGER VAN HALTEREN,
WILMINK ENGBERT, HENDRIK DOLLEMAN
and PAUL CHRISTIAAN VAN HAL

Appeal 2007-4432
Application 09/980,430
Technology Center 2600

Decided: June 10, 2008

Before ROBERT E. NAPPI, JOHN A. JEFFERY,
and CARLA M. KRIVAK, *Administrative Patent Judges*.

JEFFERY, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from the Examiner's
rejection of claims 8-11 and 27-36.¹ We have jurisdiction under 35 U.S.C.

¹ Contrary to the Appeal Brief filed February 16, 2006 (App. Br. 2), claims 12-26 have been withdrawn from consideration and are not canceled. The Advisory Action, mailed September 2, 2004, indicates the Amendment

§ 6(b). We affirm-in-part and enter a new ground of rejection under 37 C.F.R. § 41.50(b).

STATEMENT OF THE CASE

Appellants invented a coil assembly for an electro-acoustic transducer. The assembly includes a coil having an opening defining a longitudinal axis and an electronic circuit board positioned against and adhered to the coil in essentially perpendicular relationship to the axis. The circuit board may include electronics for signal processing. This assembly reduces the labor and time involved in constructing the transducer.²

Claim 8 is illustrative:

8. A coil assembly for an electroacoustic transducer, comprising:

a coil having a coil opening defining an axis therethrough; and

an electric circuit board wherein at least a surface portion thereof is positioned against said coil in a substantially perpendicular relationship to said axis.

The Examiner relies on the following prior art references to show unpatentability:

Sone US 5,432,758 Jul. 11, 1995

Lee US 5,861,686 Jan. 19, 1999

under 37 C.F.R. § 1.116, filed July 19, 2004, has not been entered for purposes of appeal.

² See generally Spec. 2:1-3:6 and 4:14-5:6.

The following reference is cited in a new ground of rejection under 37 C.F.R. § 41.50(b):

“Linear Transverters for 144 and 220 MHz” in *The ARRL Handbook For Radio Amateurs 1993*, ch. 31, pp. 31-17 through 31-28 (Am. Radio Relay League) (17th ed. 1992).

The Examiner’s rejections are as follows:

1. Claim 28 stands rejected under 35 U.S.C. § 112, ¶2.
2. Claims 8, 9, 31, and 32 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Lee.
3. Claims 8, 10, 11, 27, 29-31, and 33-36 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Sone.³

Rather than repeat the arguments of Appellants or the Examiner, we refer to the Briefs⁴ and the Answer⁵ for their respective details. In this decision, we have considered only those arguments actually made by Appellants. Arguments, which Appellants could have made but did not make in the Briefs, have not been considered and are deemed to be waived. See 37 C.F.R. § 41.37(c)(1)(vii).

³ The rejections of claim 8 under 35 U.S.C. § 102(a) as being anticipated by Kuwabara (US Patent 6,023,518) and claims 9, 10, 29 and 31-33 under 35 U.S.C. § 103(a) as being unpatentable by Kuwabara have been withdrawn (Ans. 6). Additionally, the rejection of claims 9 and 32 under 35 U.S.C. § 102(b) as being anticipated by Sone has been withdrawn (Ans. 6).

⁴ We refer to the most recent Appeal Brief, filed February 16, 2006, and the most recent Reply Brief, filed July 24, 2006, throughout this opinion.

⁵ We refer to the most recent Examiner’s Answer mailed May 19, 2006, throughout this opinion.

OPINION

The Indefiniteness Rejection

We first consider the Examiner's rejection of claim 28 under 35 U.S.C. § 112, ¶ 2 as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellants regard as the invention. The Examiner finds claim 28 is indefinite because it depends from withdrawn claim 12 (Ans. 3). Appellants argue that the non-entered Amendment⁶ changing the dependency to claim 27 overcomes the rejection (App. Br. 4).

At the outset, we note that claim 12 has been withdrawn from consideration as being drawn to a non-elected invention.⁷ Similarly, claim 28 should have been withdrawn from consideration.⁸ Additionally, claim 12 recites that a surface portion of the electric circuit board is positioned against the coil by adhesion, and claim 28 further limits the type of adhesion to glue. There is a reasonable degree of clarity and particularity with regards to the recitation in claim 28 regarding the type of adhesion, and we see no ambiguity.

For the foregoing reasons, we will not sustain the Examiner's indefiniteness rejection of claim 28.

The Anticipation Rejection Based on Lee

We next consider the Examiner's rejection of claims 8, 9, 31, and 32 under 35 U.S.C. § 102(b) as being anticipated by Lee. "A claim is

⁶ See the Advisory Action, mailed September 2, 2004.

⁷ See Paragraph 6 of the Non-Final Office Action mailed August 27, 2003.

⁸ See 37 C.F.R. § 1.142(b) and MPEP § 821.

anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros, Inc.. v. Union Oil Co. of Calif.*, 814 F.2d 628, 631 (Fed. Cir. 1987). Appellants group the arguments according to the following claims: (1) 8 and 9 and (2) 31 and 32 (App. Br. 9-10; Reply Br. 4-5). Below, each group will be addressed.

Claims 8 and 9

Regarding representative independent claim 8,⁹ the Examiner indicates that Lee discloses all the claimed subject matter (Ans. 3). Appellants argue that element 3b in Lee is not an electronic circuit board. Specifically, Appellants contend the recited electric circuit board in Lee is not shown and that the purpose of element 3b is to vibrate in response to a given frequency sent by the printed circuit board not shown (App. Br. 9-10).

Lee discloses the second vibration element 3b is “also used as a circuit board for the coil 8” (Lee, col. 3, ll. 50-51 and col. 4, l. 17). This disclosure clearly states that element 3b serves two functions – one as a vibration member to generate sounds (Lee, col. 5, ll. 15-16) and another as a circuit board for the coil (Lee, col. 3, ll. 49-51 and col. 6, ll. 10-16). Additionally, Lee discloses two circuit boards: (1) the vibration element 3b and (2) the printed circuit board for the cellular or pager phone (Lee, col. 4, ll. 15-17). The fact that more than one circuit board is disclosed does not detract from the explicit disclosure in Lee that element 3b is a circuit board for the coil

⁹ Appellants argue claims 8 and 9 as a group (App. Br. 9-10; Reply Br. 4). Accordingly, we select claim 8 as representative. *See* 37 C.F.R. § 41.37(c)(1)(vii).

(Lee, col. 3, ll. 41-51) and fully meets the limitation to an electric circuit board in claim 8.

For the foregoing reasons, Appellants have not shown error in the anticipation rejection of independent claim 8 based on Lee. Accordingly, we sustain the rejection of claim 8 and claim 9 which falls with claim 8.

Claims 31 and 32

Regarding representative independent claim 31,¹⁰ Appellants argue that Lee does not include signal processing electronics (Reply Br. 4). This argument was not timely raised in the Appeal Brief, but rather was brought up for the first time in the Reply Brief. As such, this argument is waived.¹¹ In any event, the respective electric circuit board in Lee (member 3b) includes electronics which are used to convert or process the electrical signals into acoustic energy (Lee, col. 3, ll. 41-51, col. 4, ll. 7-17, col. 5, ll. 38-44, and col. 6, ll. 10-16). Additionally, given the breadth of the recited “signal processing electronics” limitation, the electronics of the electric circuit board 3b in Lee that convert and process the electric signals to acoustic energy amply disclose signal processing electronics.

For the foregoing reasons, Appellants have not shown error in the anticipation rejection of independent claim 31 based on Lee. Accordingly, we sustain the rejection of claim 31 and claim 32 which falls with claim 31.

¹⁰ Appellants argue claims 31 and 32 as a group (Reply Br. 4-5). Accordingly, we select claim 31 as representative. *See* 37 C.F.R. § 41.37(c)(1)(vii).

¹¹ *See Optimus Tech., Inc. v. Ion Beam Appl. S.A.*, 469 F.3d 978, 989 (Fed. Cir. 2006) (“[A]n issue not raised by an appellant in its opening brief ... is waived.”) (citations and quotation marks omitted).

The Anticipation Rejection Based on Sone

We finally turn to the Examiner's rejection of claims 8, 10, 11, 27, 29-31, and 33-36 under 35 U.S.C. § 102(b) as being anticipated by Sone.

Appellants group the arguments according to the following: (1) claims 8, 10, and 30; (2) claims 11 and 34; (3) claims 27 and 35; (4) claims 29, 31, and 33 (App. Br. 5-9; Reply Br. 2-4); and (5) claim 36. Below, each group will be addressed.

Claims 8, 10, and 30

Regarding representative claim 8,¹² the Examiner's rejection finds that Sone discloses all the claimed subject matter (Ans. 4). Appellants argue that Sone does not disclose an electronic circuit board. Specifically, Appellants take the position that plate 40 in Sone is part of a closed magnetic circuit and that none of the elements selected by the Examiner (40, 42, 44, 48, 50, 52) make up an electric circuit board. In Appellants' view, the electric circuit board in Sone is actually designated by element 62 and is not positioned against the coil as claimed (App. Br. 5-7; Reply Br. 3).

Sone discloses a plate 40 insulated by film 48 that includes conductive patterns 50 and 52 (Sone, col. 4, ll. 10-43; Figs. 1-4). The conductive patterns 50 and 52 are printed on both sides of the plate 40 and create circuitry used for mounting and interconnecting components of electrical equipment (Sone, col. 4, ll. 31-43 and col. 6, ll. 65-67). The film 48 insulates the patterns 50 and 52 from the plate 40 (Sone, col. 4, ll. 28-31 and

¹² Appellants argue claims 8, 10, and 30 as a group (App. Br. 5-8). Accordingly, we select claim 8 as representative. *See* 37 C.F.R. § 41.37(c)(1)(vii).

col. 6, ll. 15-19). Hence, the plate 40, film 48, and patterns 50 and 52 all interconnect structurally to form an electric circuit board. Moreover, there is nothing in the Specification that excludes the recited electric circuit board from comprising multiple interconnected structural elements, such as a laminate. Thus, the broadest reasonable construction of the term, “electric circuit board,” in light of the Specification would include such multiple interconnected structural elements. Additionally, irrespective of the Examiner’s statement that the printed circuit board 62 “is not included in the Office Action” (Ans. 6), the circuit board 62 along with the plate 40, film 48, and patterns 50 and 52 all make up parts of an electric circuit board as the printed circuit board 62 in Sone is soldered and electrically connected to the plate (Sone, col. 6, ll. 24-27; Fig. 5). Moreover, as the plate 40 also has a surface portion (top surface of 40 shown in Figure 1) positioned against the coil in a substantially perpendicular manner, Sone discloses at least a surface portion of an electric circuit board positioned against the coil in a substantially perpendicular relationship to the axis defined by the coil opening as recited in claim 8.

Appellants also argue that the plate 40 is part of the closed magnetic circuit and cannot be a part of an electric circuit board (App. Br. 5-6; Reply Br. 3). As previously stated, we disagree that the plate cannot be part of the electric circuit board. That is, the plate 40 serves more than one function. While acting as part of the magnetic circuit, the plate additionally serves as a substrate or base for printing the insulating film and the conductive patterns -- all of which define the electric circuit board. The plate, therefore, forms a portion of an electric circuit board.

For the above reasons, Appellants have not shown error in the anticipation rejection of claim 8 based on Sone. Accordingly, we sustain the rejection of claim 8 and claims 10 and 30 which fall with claim 8.

Claims 11 and 34

Representative claim 11¹³ further recites the electric circuit board has an opening and the opening is substantially aligned with the coil opening. The Examiner indicates how this limitation is fully met by Sone (Ans. 4). Appellants repeat the arguments made regarding claim 8 and the plate 40 in Sone not being an electric circuit board (App. Br. 8). In Appellants' view, since the plate 40 is not an electric circuit board, Sone does not disclose the electric circuit board has an opening (App. Br. 8). Our previous discussion pertaining to the disclosure of Sone and how the plate 40 is part of an electric circuit board applies equally here. We, therefore, incorporate that discussion by reference. As the plate 40 makes up a portion of the electric circuit board in Sone, the circuit board includes an opening (Sone, col. 5, ll. 19-20; Fig. 1) substantially aligned with the coil opening as recited in claim 11.

For the above reasons, Appellants have shown no error in the anticipation rejection of claim 11 based on Sone. Accordingly, we will sustain the anticipation rejection of claim 11 and claim 34 which falls with claim 11.

¹³ Appellants argue claims 11 and 34 as a group (App. Br. 8). Accordingly, we select claim 11 as representative. *See* 37 C.F.R. § 41.37(c)(1)(vii).

Claims 27 and 35

Claim 27 further recites the surface portion of the electric circuit board is positioned against the coil by adhesion. Claim 8, from which claim 27 depends, also recites the surface portion is positioned against the coil in a substantially perpendicular relationship to the axis defined by the coil opening. The Examiner indicates how this limitation is fully met by Sone through the connection of the lead wires 22 and 24 to coil and plate (Ans. 4). Appellants argue that the core 6, not the coil, is adhered or connected to the plate 40 by a screw. Based on this disclosure, the Appellants contend that Sone does not disclose the surface portion of the electric circuit board is positioned against the coil by adhesion (Reply Br. 4). Although this argument was raised for the first time in the Reply Brief and is technically waived,¹⁴ we nonetheless address this contention. Upon review, we find that Sone does not disclose or is silent regarding whether *the surface portion* of the electric circuit board that is positioned against the coil in a substantially perpendicular relationship to the axis defined by the coil opening is also positioned against the coil by adhesion.

Based on the above reasons, we will not sustain the anticipation rejection of claim 27 and claim 35 which is commensurate in scope.

¹⁴ See *Optivus*, 469 F.3d at 989.

Claims 29, 31 and 33

Representative claim 29¹⁵ further recites the electric circuit board includes electronics for signal processing. The Examiner indicates how this limitation is fully met by Sone (Ans. 4). Appellants argue that the plate 40, film 48, and conductive patterns 50 and 52 do not include electronics for signal processing (App. Br. 7-8; Reply Br. 3).

We agree with Appellants that components 40, 48, 50, and 52 in Sone are not electronics for signal processing. However, as stated above with regard to claim 8, the scope and breadth of the recited electric circuit board does not preclude multiple interconnected structural elements that include circuit board 62 in Sone. That is, Sone discloses an electric circuit board that includes plate 40, film 48, patterns 50 and 52, *and* board 62. Sone discloses the device converts electrical signals to sound, and thus the board 62 must include some electronics for signal processing (Sone, col. 1, ll. 6-9). Additionally, Appellants admit that any electronics in Sone would be on the printed board 62 (Reply Br. 3). In turn, component 62 of the electric circuit board in Sone includes electronics for signal processing as claim 29 recites.

For the above reasons, Appellants have not shown error in the anticipation rejection of claim 29 based on Sone. Accordingly, we sustain the rejection of claim 29 and claims 31 and 33 which fall with claim 29.

¹⁵ Appellants argue claims 29, 31 and 33 as a group (App. Br. 7; Reply Br. 4-5). Accordingly, we select claim 29 as representative. *See* 37 C.F.R. § 41.37(c)(1)(vii).

Claim 36

Claim 36 further recites the electric circuit board is electrically connected to the coil through lead wires. The Examiner indicates how this limitation is fully met by Sone (Ans. 5). Appellants argue that the board 62 is not electrically connected to the coil through lead wires but rather through soldering the board 62 to plate 40 (App. Br. 9). Our previous discussion pertaining to Sone and how the plate 40, film 48, patterns 50 and 52, and board 62 are parts of the electric circuit board applies equally here. We, therefore, incorporate that discussion by reference. As the plate 40 and conductive patterns 50 and 52 of Sone are part of the electric circuit board, Sone discloses a portion of the electric circuit board is electrically connected to the coil through lead wires 22 and 24 as recited in claim 36 (Sone, col. 6, l. 61 – col. 7, l. 5; Figs. 1, 3 and 5).

Based on the above reasons, Appellants have not shown error in the anticipation rejection of claim 36 based on Sone. Accordingly, we sustain the rejection of claim 36.

New Grounds of Rejection Under 35 U.S.C. §102(b)

Under 37 C.F.R. § 41.50(b), we enter a new ground of rejection under 35 U.S.C. §102(b) for claims 8, 27, 29, 31, and 35.

The following is a quotation of the appropriate paragraph of 35 U.S.C. § 102 that forms the basis for the following rejections:

A person shall be entitled to a patent unless —

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States.

Claims 8, 27, 29, 31, and 35 are rejected under 35 U.S.C. § 102(b) as being anticipated by *The ARRL Handbook for Radio Amateurs 1993* ("the ARRL Handbook").

Figure 57 of the ARRL Handbook (Page 31-25) is reproduced below:

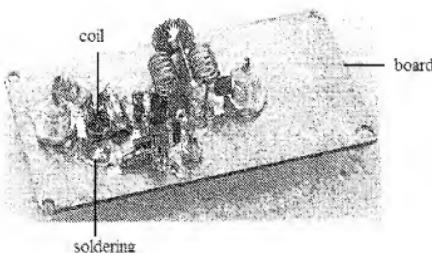


Figure 57 depicts a preamplifier with a coil and other circuit elements mounted on a board.

As shown above, the ARRL Handbook discloses a coil assembly comprising a coil (see coil reference line) having a coil opening defining an axis therethrough and an electric circuit board (see board reference line) wherein at least a surface portion is positioned against the coil in a substantially perpendicular relationship to the axis (The ARRL Handbook, 25; Fig. 57). While Figure 57 does not state the board is an electric circuit board, the plate clearly functions as part of the circuit to connect the electrical components shown into an integrated preamplifier. Thus, giving the term, "electric circuit board," its broadest reasonable interpretation, the board shown in Figure 57 is an electric circuit board.

Additionally, we note that Figure 57 shows a preamplifier, and claim 8 recites “a coil assembly for an electroacoustic transducer.” The phrase, “for an electroacoustic transducer,” is language relating to the function or intended use of the coil assembly. As courts have stated, “the absence of a disclosure relating to function does not defeat the Board’s finding of anticipation. It is well settled that the recitation of a new intended use for an old product does not make a claim to that old product patentable.” *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997). Thus, while Figure 57 and its description do not disclose the coil assembly being used in an electro-acoustic transducer, the disclosed assembly of Figure 57 is nonetheless capable of functioning as a coil assembly for an electro-acoustic transducer if it were so employed. Moreover, the coil assembly in Figure 57, as discussed above, includes all the recited structural limitations of claim 8. We, therefore, find that the coil assembly in Figure 57 of the ARRL Handbook anticipates claim 8.

Regarding claims 27 and 35, Figure 57 shows a surface portion of the electric circuit board is positioned against the coil by adhesion or soldering (see soldering reference line).

Regarding claims 29 and 31, both include the additional limitation of the electric circuit board having electronics for signal processing. As the device in Figure 57 is a preamplifier, there are ample electrical components that perform signal processing, including an output filter (the ARRL Handbook, 26). Thus, Figure 57 of the ARRL Handbook meets the limitations of the “electric circuit board includes electronics for signal processing” recited in claim 29 and the “electric circuit board including signal processing electronics” recited in claim 31.

Although we decline to reject every claim under our discretionary authority under 37 C.F.R. § 41.50(b), we emphasize that our decision does not mean the remaining claims are patentable over the ARRL Handbook. Rather, we merely leave the patentability determination of these claims to the Examiner. *See* MPEP § 1213.02.

DECISION

We have sustained the Examiner's rejections with respect to claims 8-11, 29-34 and 36. We have not, however, sustained the Examiner's rejections of claims 27, 28, and 35. Therefore, the Examiner's decision rejecting claims 8-11 and 27-36 is affirmed-in-part. We have, however, entered a new ground of rejection under 37 C.F.R. § 41.50(b) for claims 8, 27, 29, 31, and 35.

This decision contains a new ground of rejection pursuant to 37 C.F.R. § 41.50(b). Section 41.50(b) provides that “[a] new ground of rejection . . . shall not be considered final for judicial review.”

This section also provides that the Appellants, **WITHIN TWO MONTHS FROM THE DATE OF THE DECISION**, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

- (1) *Reopen prosecution.* Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceeding will be remanded to the examiner. . . .

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(2) *Request rehearing.* Request that the proceeding be reheard under § 41.52 by the Board upon the same record. . . .

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED-IN-PART
37 C.F.R. § 41.50(b)

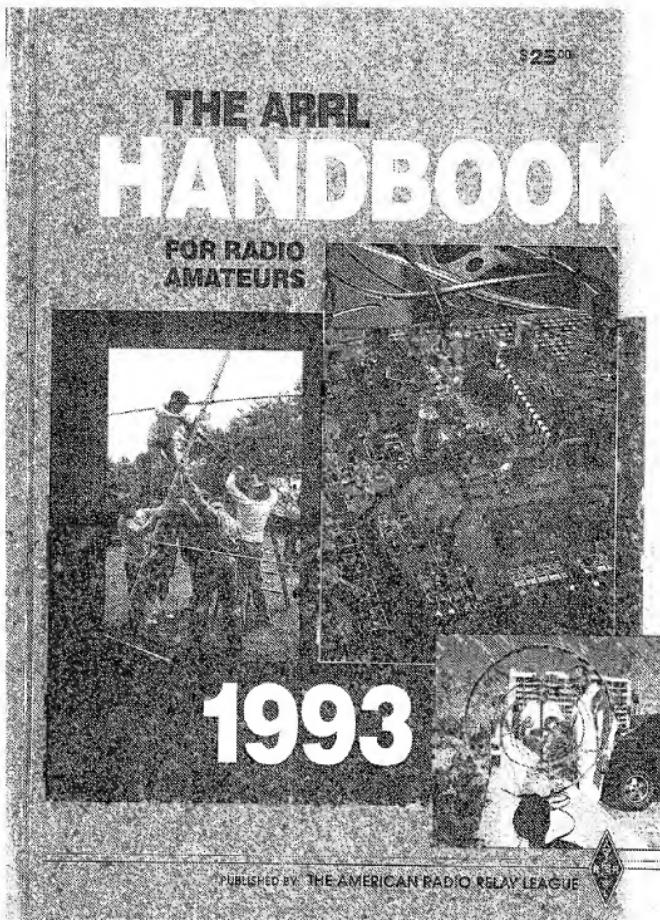
KIS

NIXON PEABODY, L.L.P.
161 N. CLARK STREET
48TH FLOOR
CHICAGO, IL 60601-3213

Appeal 2007-4432
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EVIDENCE APPENDIX

Appeal 2007-4432
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**THE ARRL
HANDBOOK**
FOR RADIO AMATEURS

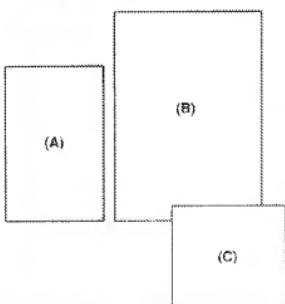
1993

Seventeenth Edition



Published by:

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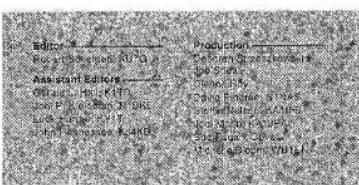


Cover photos

A - At the W3CK Field Day site in eastern Pennsylvania, NOLAU fastens the boom to a mast with the help of many friends. (photo by N6GWR)

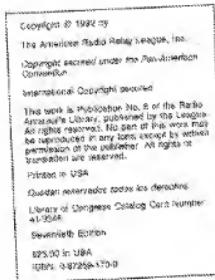
B - The ChipTaker project is new to this year's Handbook. Look for the voice memory keyer in the Digital Equipment chapter.

C - Here's a view down the barrel of a 1296-MHz loop-Yagi antenna. (Don't do this with a transmitter connected!) In the background is the site of the 1992 West Coast VHF/UHF Conference and the Pacific Ocean. (photo by Gary Jue, N6QDA)



Contributors

Doug Bambridge, N1HPK
John Beirne, VE2CV
Bert Bell, W4BZ
John Blodgett, W4PWF
Bill de Groot, W2ID
Warren Dow, N1B8H
Martin Ermelinen, 33QQQ
Bill English, N8TJW
Ed Hines, KA1CV
Dick Jansson, WD4FAB
Joe Jarrett, K1FOG
Roy Leestad, W4EL
William E. Sabin, W8YH
Dick Stevens, W1CWJ
Glenn L. Williams, APEC



Linear Transverters for 144 and 220 MHz

The CW and SSB portions of the 146.1208-MHz bands have been studied with Δt during the past few years. Although there is plenty of summertime CW in the SSB space, for 146 MHz, there is little CW in the 146.1208-MHz space, W312JY, and hence the CW features have not been reported here and shown in Fig. 3-40 through 3-67. These present results indicate that a standard 28-MHz receiver, as a basis for 144 or 220-MHz operation, is not less complicated than the 146-MHz receiver, and all of the good features of the HF rig (Fig. 3-67) in the SSB source, stable VFO, VSWR, noise figure, and so on, are incorporated. Chapter 12 contains additional information on transmitter theory. Although these transmitters may be built in any way convenient, the author has found it particularly easy to use the parts of the 146-MHz rig to build the 144-MHz and 220-to-230-MHz 12-23 VSWR source, and an antenna is the only additional equipment necessary to complete the 1420 system.

The complete transceiver design includes a set of hand-coded components that should be easily reproducible. Although the text and illustrations concern the 220-MHz transceiver, component values are given for the 144-MHz QRP. Except for the local oscillator (LO), details are common to both designs. The receiver converter has a 0.6 dB noise figure and an overall conversion gain of 18. These figures were verified on an Agilent noise-figure meter while using an LNA noise source. Transistor converter

Power output is a conservative 1 W under linear operation. The companion amplifier produces 8 to 10 W of linear output power. Much care was taken to make the transmission chain as clean as possible, and the receiver incorporates techniques to minimize sensitivity and dynamic range.

CIRCUIT DESCRIPTION

Fig. 51 shows the transmitter limit.

program. The main difference between the 144- and 220-MHz versions is the LO. Although transceive operation is desired, the experimenter may choose to limit construction to either transceive or receive only. LO energy is injected into a high-level (+17 dBm) doubly balanced mixer during receive. Received signals are amplified by a GaAsFET preamplifier and then filtered before entering the mixer. The 220-MHz

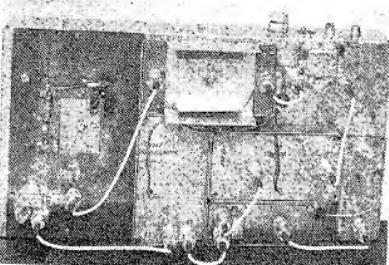
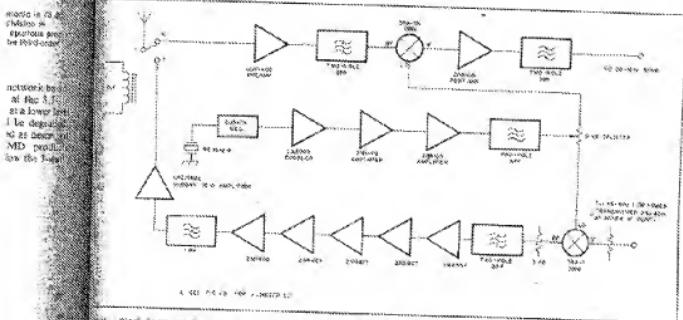
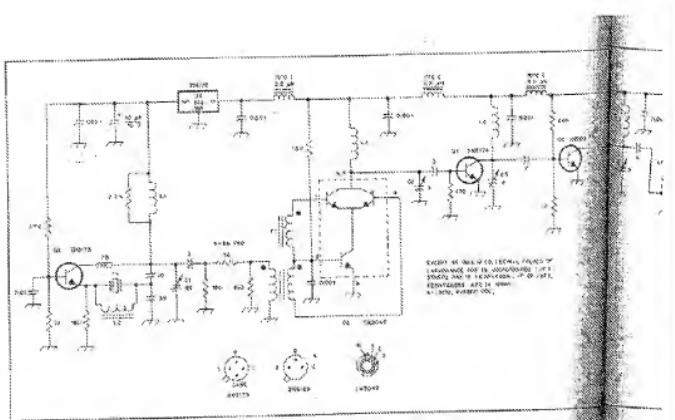


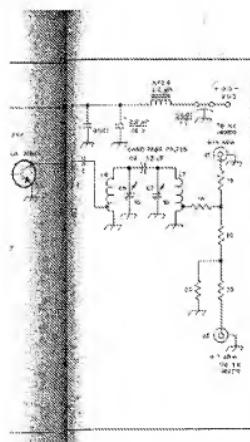
Fig. 40 - This 164- or 220-hertz stereoverter is built using a modular circuit approach. Each stage is forced to converge on a precise 100-ohm load, resulting in a total output of about 100 watts at 1000 cps.



• 2000 channels of the 100 and 210 MHz transmitters. All blocks but the 200 MHz blocks are common to both transmitters.

VHF Radio Equipment 31-13





circuits in the 7000s and, in each case, the converter consists of a GaAsFET preamplifier, a mixer/diplexer circuit and an optional 28-MHz post amplifier. The mixer/diplexer and post amplifier circuits are the same, regardless of band. Each of the three converter modules is contained in a separate module. This was done to facilitate expansion and reworking of each stage. Of course, it is possible to build all three circuits in one box. This subject will be addressed in the conclusion portion of this article.

Match

The heart of the receiver converter is a Mini-Circuits SPA-1M high-level, doubly balanced mixer (DBM). See Fig. 45. This mixer requires an LO injection level of +17 dBm, compared with +7 dBm injection level required for standard mixers. The SPA-1M is a high-quality device with signal handling characteristics while maintaining the port-to-port isolation, image suppression and linearity inherent in a DBM. The SPA-1M is moderately priced and available in small quantities directly from the manufacturer.

Positive terminations can ruin the excellent IMD characteristics of a DBM.¹³ The IF port, in particular, is most sensitive to a nonresistive 50-ohm termination. Anything short of a 20-dB return loss at the IF port will result in increased IMD and a significant third-order intercept point. Feeding the output of a 28-MHz diplexer directly into a narrowband amplifier will decrease the mixer's third-order intercept point as compared to a wideband receiver termination. The diplexer circuit shown in Fig. 45 represents one solution to the problem of proper termination. The diplexer low-pass response presents a 20-dB return loss at 28 MHz and terminates higher frequencies into 50 ohms.

RF Preamp

A low-noise, high-dynamic-range GaAsFET preamplifier is shown in front of the 28-MHz diplexer in Fig. 45. The 144-MHz transverter uses 10.2-MHz noise-reducing crystal Q73 to aid frequency multiplication. Oscillated output is amplified by Q2 and Q5 until it is sent to the 28-MHz diplexer. The transmit and receive mixers, LO output and a double-balanced LO mixer diode are in the fiber. A resistive power divider is used to drive the transmit and receive port again, pads attenuate the signal to proper level.

With the fibers properly adjusted, all noise figures from the LO are about 10 dB below the fundamental. Fig. 44 is the spectral output from the LO over the year.

Local Oscillator

The 144- and 228-MHz receive converters are identical, except for the tuned,

receive LNA matching. A 10-mA bias current achieves optimum signal-handling capability. The third-order-intercept point is +23 dBm, Gain is 24 dB.

The double-urned mixer provides a reasonable degree of linearity, so it is possible to attenuate the 148-MHz (148 MHz for the receiver, residual image). Fig. 47A shows the swept frequency response of the 228-MHz version. A comb line or helical filter might be used if greater selectivity is required.

28-MHz Post Amplifier

For most amateur applications, a 28-MHz post amplifier is not necessary. It serves to amplify the 28-MHz signal to increase S-meter readings. The author lives among several of the "big guy" VHF stations in southeastern Pennsylvania. High dynamic range is essential to avoid overdriving the receiver. The 28-MHz converter operates nicely without any post amplification, thereby preserving the 3F receiver's dynamic range.

The 28-MHz post amplifier shown in Fig. 48 has been included here for those operators who prefer to have a way to key strong 28-MHz signals. The IN2109 is readily available and provides good performance at low cost. In this circuit, the device is biased to provide 15 dB gain with a third-order-intercept point of +6 dBm. The design features a simple circuit and uses standard component capacitors. A double-tuned band-pass filter at the output assures a clean signal for the 3F receiver. Fig. 47B shows the swept frequency response of the post amplifier.

If you live in an area with load level signals, yet want to have a post amplifier, you can simply add between the post amplifier and the 3F receiver to reduce the converter gain to a level that the 3F receiver can handle. The value of attenuation will depend on the 3F receiver's ability to handle large signals. When you first connect the receiver converter to the 3F receiver, you will probably notice that the S-meter on the converter is off scale. The amount of attenuation depends on the nature of your specific receiver, even with no signals present. To determine the right pad value for your application, place a variable step attenuator in the line between post amplifier and 3F receiver and increase the attenuator until the 3F receiver S-meter is just above zero. If you want to leave the step attenuator in the line, fine. If not, you can build a pad with the correct value from the attenuator tables given in Chapter 23 of this Handbook.

Transwell Converter

A schematic diagram for the 1-W transwell converter is shown in Fig. 49. The 129-MHz LO (116-MHz LO for the 144-MHz version) and 28-MHz signals are mixed in a Mini-Circuits SPA-1 standard-level DBM. A pad is necessary to match the 28-MHz input to a maximum level of -10 dBm, ensuring good linearity.

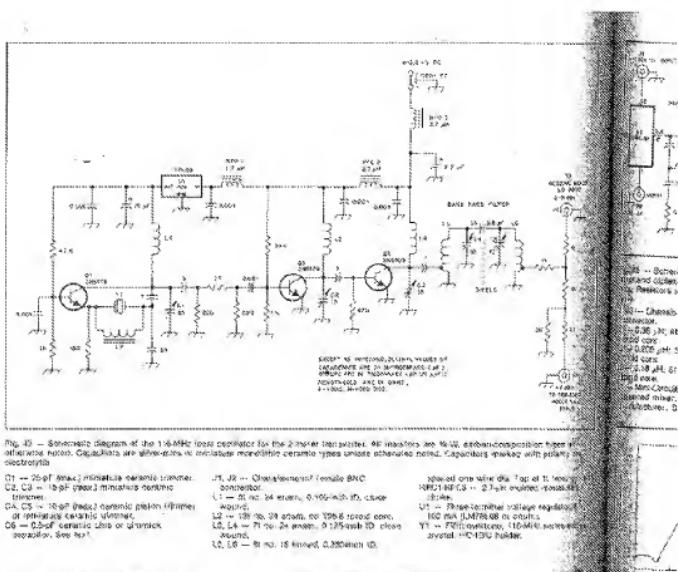


Fig. 40.—Schematic diagram of the 116-MHz local oscillator for the 2-meter transverter. RF transistors are MJE34, carbon-composition types unless otherwise noted. Capacitors are silver-glass or miniature monolithic ceramic types unless otherwise noted. Capacitors marked with μ are electrolytic.

GT -- 25-pF thick; minimizes ceramic thickness.
 G2, G3 -- 15-pF thick; minimizes ceramic thickness.
 GA, GS -- 10-pF thick; ceramic piston (flange) or minimizes ceramic thickness.
 GS -- 0.5- μ m ceramic film or vitamix.

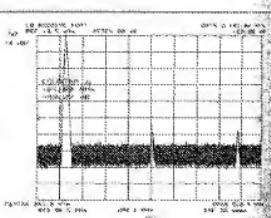
J1, J2 -- Cheliferan? female BNC
conservation.
J1 -- 21 mm, 24 setae, 0.765 mm ID, chisel
wings.
J2 -- 13 mm, 28 setae, no 1996 record con-
cern.
J3, J4 -- 7 to 10 mm, 24 setae, 0.125 mm ID chisel
wings.
J5, J6 -- 8 to 10 mm, 18 setae, 0.200 mm ID.

Phase-ell one-wire dia. Top of the heating
SRC11HFC1S = 2.7-kW resistive, 100250-VAC
11 = Phase-terminal voltage regulator
100 max JLM7808 or similar
11 = Peltier modules, 110-Milc. package
system = C13U holder.

speaking pair. No parts values are shown for the 18-pad, the exact resistor values will depend on the amount of 28-dBm drive available from the transmitter output of your 1P transceiver. For example, if your 1P rig delivers 26 mW (+13 dBm) at the transmitter output, you would need to build a 23-dB pad. See Chapter 23 for tables listing resistor values for different levels of attenuation.

Minor output is fed through a positive resistive pad for pre-terminal gain, and then filtered by a double-tuned band-pass filter to reduce the image and other undesired reading noise. Two 2N2545 amplifier stages follow the filter, followed by two 2N5426 stages. The final amplifier stage is a 2N5426. All stages are biased for class A operation. The 2N5426 may be substituted with a lower-power 2N5445 or 2N5944 device; if you substitute, you may have to alter the input and output matching, as well as the bias circuit. A 7-pole low-Cutaway low-pass filter (Fig. 30) follows the 2N5426. Sweep filter response is shown in Fig. 5. 1. The output is exceptionally clean; a spectrum

Fig. 42.—Spectra output of the 100-MHz LO receiver port. All fragments and spectrum outputs are at least 16 dB below peak fundamental.

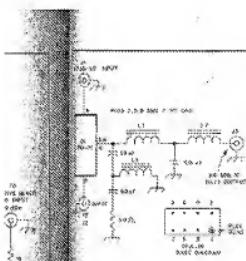


100 nm is shown in Fig. 5(A).

Although some designers may question the use of five stages to achieve 1-watt output, there are several good reasons for doing so. This approach is recommended

or nonnegative operation when filtered I-W output. It is not "upbeat," like some four-stage designs. Stages are run below their maximum

Street Prod.
The Marine in
Black Mirror of
Imperialism



6.15 — Schematic diagram of the receiver and diplexer filter. Capacitors are silver mica. Resistors are 1% W carbon-composition resistors.

6.16 — Glass-to-metal terminal BNC connector.

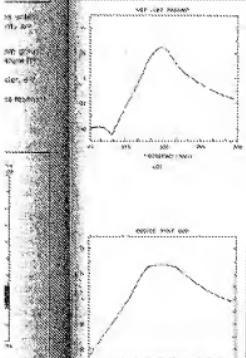
— 0.05 μ H, 16 ohm, 24 watts, on T-50-6 dual bob.

— 0.05 μ H, 16 ohm, 24 watts, on T-50-6 dual bob.

— 0.10 μ H, 16 ohm, 24 watts, on T-50-6 dual bob.

— 0.10 μ H, 16 ohm, 24 watts, on T-50-6 dual bob.

— 100 μ H, 100 ohm, 100 watts, on the transmitter. See text.



— Except response of the 225-MHz filter (a) and the 264-MHz pass amplifier to most of the output of the 262 preamplifier provided a data null at 262.

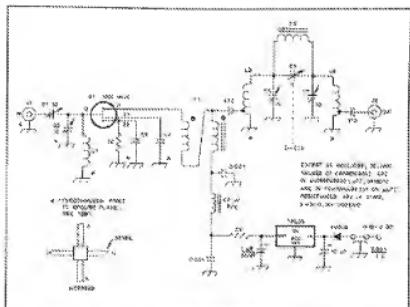


Fig. 4a - Schematic diagram of the 144-MHz or 220-MHz GigaBit Ethernet receiver. All resistors are 1/4-W carbon composition unless otherwise noted. Capacitors are 100-nF unless otherwise noted. Component values are types unless otherwise noted. Capacitors marked with asterisks are electrolytic.
 G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, G11, G12, G13, G14, G15, G16, G17, G18, G19, G20, G21, G22, G23, G24, G25, G26, G27, G28, G29, G30, G31, G32, G33, G34, G35, G36, G37, G38, G39, G40, G41, G42, G43, G44, G45, G46, G47, G48, G49, G50, G51, G52, G53, G54, G55, G56, G57, G58, G59, G60, G61, G62, G63, G64, G65, G66, G67, G68, G69, G70, G71, G72, G73, G74, G75, G76, G77, G78, G79, G80, G81, G82, G83, G84, G85, G86, G87, G88, G89, G90, G91, G92, G93, G94, G95, G96, G97, G98, G99, G100, G101, G102, G103, G104, G105, G106, G107, G108, G109, G110, G111, G112, G113, G114, G115, G116, G117, G118, G119, G120, G121, G122, G123, G124, G125, G126, G127, G128, G129, G130, G131, G132, G133, G134, G135, G136, G137, G138, G139, G140, G141, G142, G143, G144, G145, G146, G147, G148, G149, G150, G151, G152, G153, G154, G155, G156, G157, G158, G159, G160, G161, G162, G163, G164, G165, G166, G167, G168, G169, G170, G171, G172, G173, G174, G175, G176, G177, G178, G179, G180, G181, G182, G183, G184, G185, G186, G187, G188, G189, G190, G191, G192, G193, G194, G195, G196, G197, G198, G199, G200, G201, G202, G203, G204, G205, G206, G207, G208, G209, G210, G211, G212, G213, G214, G215, G216, G217, G218, G219, G220, G221, G222, G223, G224, G225, G226, G227, G228, G229, G229, G230, G231, G232, G233, G234, G235, G236, G237, G238, G239, G239, G240, G241, G242, G243, G244, G245, G246, G247, G248, G249, G249, G250, G251, G252, G253, G254, G255, G256, G257, G258, G259, G259, G260, G261, G262, G263, G264, G265, G266, G267, G268, G269, G269, G270, G271, G272, G273, G274, G275, G276, G277, G278, G279, G279, G280, G281, G282, G283, G284, G285, G286, G287, G288, G289, G289, G290, G291, G292, G293, G294, G295, G296, G297, G298, G299, G299, G300, G301, G302, G303, G304, G305, G306, G307, G308, G309, G309, G310, G311, G312, G313, G314, G315, G316, G317, G318, G319, G319, G320, G321, G322, G323, G324, G325, G326, G327, G328, G329, G329, G330, G331, G332, G333, G334, G335, G336, G337, G338, G339, 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G775, G776, G777, G778, G778, G779, G779, G780, G781, G782, G783, G784, G785, G786, G787, G788, G788, G789, G789, G790, G791, G792, G793, G794, G795, G796, G797, G797, G798, G798, G799, G799, G800, G801, G802, G803, G804, G805, G806, G807, G808, G809, G809, G810, G811, G812, G813, G814, G815, G816, G817, G817, G818, G818, G819, G819, G820, G821, G822, G823, G824, G825, G826, G827, G828, G829, G829, G830, G831, G832, G833, G834, G835, G836, G837, G838, G839, G839, G840, G841, G842, G843, G844, G845, G846, G847, G848, G849, G849, G850, G851, G852, G853, G854, G855, G856, G857, G858, G859, G859, G860, G861, G862, G863, G864, G865, G866, G867, G868, G869, G869, G870, G871, G872, G873, G874, G875, G876, G877, G878, G878, G879, G879, G880, G881, G882, G883, G884, G885, G886, G887, G888, G888, G889, G889, G890, G891, G892, G893, G894, G895, G896, G897, G897, G898, G898, G899, G899, G900, G901, G902, G903, G904, G905, G906, G907, G908, G909, G909, G910, G911, G912, G913, G914, G915, G916, G917, G917, G918, G918, G919, G919, G920, G921, G922, G923, G924, G925, G926, G927, G928, G929, G929, G930, G931, G932, G933, G934, G935, G936, G937, G938, G939, G939, G940, G941, G942, G943, G944, G945, G946, G947, G948, G949, G949, G950, G951, G952, G953, G954, G955, G956, G957, G958, G959, G959, G960, G961, G962, G963, G964, G965, G966, G967, G968, G969, G969, G970, G971, G972, G973, G974, G975, G976, G977, G978, G978, G979, G979, G980, G981, G982, G983, G984, G985, G986, G987, G988, G988, G989, G989, G990, G991, G992, G993, G994, G995, G996, G997, G997, G998, G998, G999, G999, G1000, G1001, G1002, G1003, G1004, G1005, G1006, G1007, G1008, G1009, G1009, G1010, G1011, G1012, G1013, G1014, G1015, G1016, G1017, G1017, G1018, G1018, G1019, G1019, G1020, G1021, G1022, G1023, G1024, G1025, G1026, G1027, G1028, G1029, G1029, G1030, G1031, G1032, G1033, G1034, G1035, G1036, G1037, G1038, G1039, G1039, G1040, G1041, G1042, G1043, G1044, G1045, G1046, G1047, G1048, G1049, G1049, G1050, G1051, G1052, G1053, G1054, G1055, G1056, G1057, G1058, G1059, G1059, G1060, G1061, G1062, G1063, G1064, G1065, G1066, G1067, G1068, G1069, G1069, G1070, G1071, G1072, G1073, G1074, G1075, G1076, G1077, G1078, G1078, G1079, G1079, G1080, G1081, G1082, G1083, G1084, G1085, G1086, G1087, G1088, G1088, G1089, G1089, G1090, G1091, G1092, G1093, G1094, G1095, G1096, G1097, G1097, G1098, G1098, G1099, G1099, G1100, G1101, G1102, G1103, G1104, G1105, G1106, G1107, G1108, G1109, G1109, G1110, G1111, G1112, G1113, G1114, G1115, G1116, G1117, G1117, G1118, G1118, G1119, G1119, G1120, G1121, G1122, G1123, G1124, G1125, G1126, G1127, G1128, G1129, G1129, G1130, G1131, G1132, G1133, G1134, G1135, G1136, G1137, G1138, G1139, G1139, G1140, G1141, G1142, G1143, G1144, G1145, G1146, G1147, G1147, G1148, G1148, G1149, G1149, G1150, G1151, G1152, G1153, G1154, G1155, G1156, G1157, G1158, G1159, G1159, G1160, G1161, G1162, G1163, G1164, G1165, G1166, G1167, G1168, G1169, G1169, G1170, G1171, G1172, G1173, G1174, G1175, G1176, G1177, G1178, G1178, G1179, G1179, G1180, G1181, G1182, G1183, G1184, G1185, G1186, G1187, G1188, G1188, G1189, G1189, G1190, G1191, G1192, G1193, G1194, G1195, G1196, G1197, G1197, G1198, G1198, G1199, G1199, G1200, G1201, G1202, G1203, G1204, G1205, G1206, G1207, G1208, G1209, G1209, G1210, G1211, G1212, G1213, G1214, G1215, G1216, G1217, G1217, G1218, G1218, G1219, G1219, G1220, G1221, G1222, G1223, G1224, G1225, G1226, G1227, G1228, G1229, G1229, G1230, G1231, G1232, G1233, G1234, G1235, G1236, G1237, G1238, G1239, G1239, G1240, G1241, G1242, G1243, G1244, G1245, G1246, G1247, G1248, G1249, G1249, G1250, G1251, G1252, G1253, G1254, G1255, G1256, G1257, G1258, G1259, G1259, G1260, G1261, G1262, G1263, G1264, G1265, G1266, G1267, G1268, G1269, G1269, G1270, G1271, G1272, G1273, G1274, G1275, G1276, G1277, G1278, G1278, G1279, G1279, G1280, G1281, G1282, G1283, G1284, G1285, G1286, G1287, G1288, G1288, G1289, G1289, G1290, G1291, G1292, G1293, G1294, G1295, G1296, G1297, 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G1418, G1418, G1419, G1419, G1420, G1421, G1422, G1423, G1424, G1425, G1426, G1427, G1428, G1429, G1429, G1430, G1431, G1432, G1433, G1434, G1435, G1436, G1437, G1438, G1439, G1439, G1440, G1441, G1442, G1443, G1444, G1445, G1446, G1447, G1448, G1449, G1449, G1450, G1451, G1452, G1453, G1454, G1455, G1456, G1457, G1458, G1459, G1459, G1460, G1461, G1462, G1463, G1464, G1465, G1466, G1467, G1468, G1469, G1469, G1470, G1471, G1472, G1473, G1474, G1475, G1476, G1477, G1478, G1478, G1479, G1479, G1480, G1481, G1482, G1483, G1484, G1485, G1486, G1487, G1488, G1488, G1489, G1489, G1490, G1491, G1492, G1493, G1494, G1495, G1496, G1497, G1497, G1498, G1498, G1499, G1499, G1500, G1501, G1502, G1503, G1504, G1505, G1506, G1507, G1508, G1508, G1509, G1509, G1510, G1511, G1512, G1513, G1514, G1515, G1516, G1517, G1517, G1518, G1518, G1519, G1519, G1520, G1521, G1522, G1523, G1524, G1525, G1526, G1527, G1528, G1529, G1529, G1530, G1531, G1532, G1533, G1534, G1535, G1536, G1537, G1538, G1539, G1539, 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G1908, G1908, G1909, G1909, G1910, G1911, G1912, G1913, G1914, G1915, G1916, G1917, G1917, G1918, G1918, G1919, G1919, G1920, G1921, G1922, G1923, G1924, G1925, G1926, G1927, G1928, G1929, G1929, G1930, G1931, G1932, G1933, G1934, G1935, G1936, G1937, G1938, G1939, G1939, G1940, G1941, G1942, G1943, G1944, G1945, G1946, G1947, G1948, G1949, G1949, G1950, G1951, G1952, G1953, G1954, G1955, G1956, G1957, G1958, G1959, G1959, G1960, G1961, G1962, G1963, G1964, G1965, G1966, G1967, G1968, G1969, G1969, G1970, G1971, G1972, G1973, G1974, G19

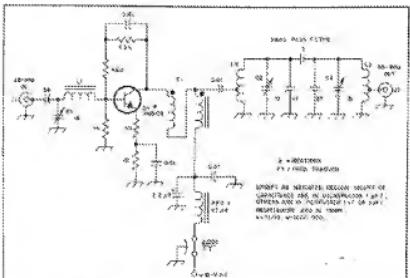


Fig. 4B - Generation diagram of the *Salmo trutta* population at Langvatnet. All ages are 1984 year-class. Compartments refer unless otherwise noted. Capital letters are universal for all maturation categories. Small type within brackets otherwise noted. Capital letters with subscripts are populations which are electrically fished.

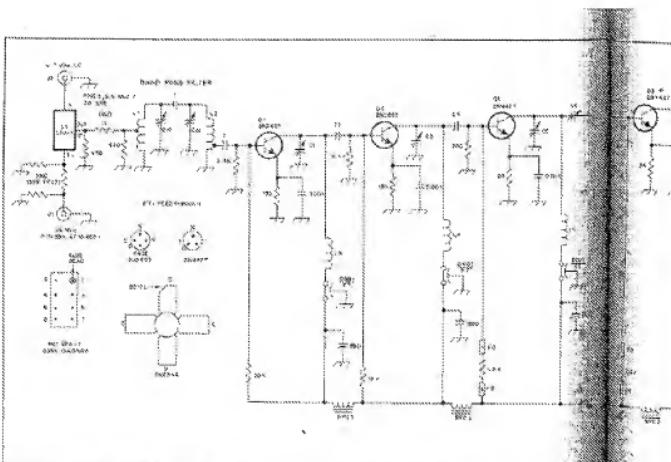


Fig. 46. — Schematic diagram of the 14- and 220-MHz transonic compressor. All dimensions are in millimeters. The airframe is 1000 mm wide. (Courtesy of the Royal Aircraft Establishment, Farnborough, England.)

11.17 ... 220 MHz; At res. 20 mhos, 0.95
 ④ balanced one-wire line. Tap off at ground, 46 MHz. Series 220 MHz coil
 coil 28
 12.18 ... 220 MHz; At res. 20 mhos,
 6,285-ohm 10', spaced 200-ohm 18'
 Series 220 MHz coil, tap off at 10'.
 14 ... 220 MHz; 20 mhos, 6,285-ohm

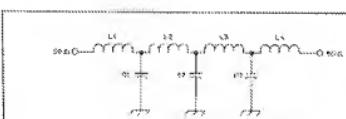


Fig. 50 - Schematic diagram of T-constant Cascaded low-pass filter. Dimensions are in millimeters type.

operation. The gains from the extra stage also allow the use of the filters after the mixer and at the output. The author lives in an area where the VHF bands are congested, so clean, linear operation is a must for sound relations with other amateurs sharing the band.

Power Amplifier

An optional 8- to 14-W Unid power

amplifier is shown schematically in Fig. 52. This amplifier uses another 2N3906 transistor. The design is relatively simple. Input matching is accomplished by C1. C2 and L1, L2, C3 and C4 match the output. The only differences between the 220-MHz and 144-MHz versions are the values of L1 and L2.

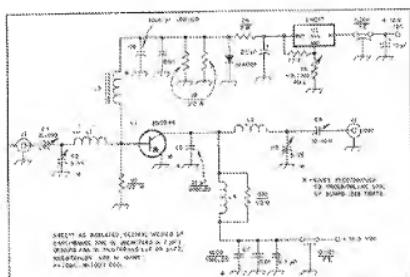
The new circuit, suggested by DR. G. M. MASCARO, WASHUP, uses an LM317 ad-

adjustable regulator to provide a self-supply. The LMB17 circuit is capable of providing 30- to 40- μ A of gate current.

Switching

Fig. 53 is a schematic diagram of a transceiver switching circuitry 830 for switch power to the transceiver 820 in transmit and receive. When no one

is powered
to the L
geamplifiers
When 22 is c
the presam
pplies 12.5
and power
amplifier
and when 22 is c
the HF delay
and the VHF pa
mmpifier or
generally at
dynamics. Si
negative trans
sions, no re
sidual. Th
is connected
on the HI
mmpifier with
a transversal
circuit, and
with 26-1.



output by capacitively coupling into a receiver or spectrum analyzer from the 50-ohm pad at the output of the stage. When you are sure Q1 is working, build the next stage and test it. Proceed alternately building and testing each stage until you reach the final output stage.

When all of the LC stages are complete, check the operating frequency with a counter or spectrum analyzer. Tune each stage for maximum output. Tuning is somewhat interactive, so recheck each stage after you have done the initial tuning. Each variable capacitor should have a definite peak. If you have a method of checking low power levels, check the output at the receive and transmit ports. Power output should be as indicated on the drawings.

All other stages are constructed in a like manner. Lay the board out in advance; start at the input and work toward the output. Test each stage after you build it, and fix any problems before continuing to the next stage.

Parametric

The GRAD-167 transistor requires special handling care because it is especially sensitive to static electricity. Solder the transistor into the circuit last, use a ground-type, low-temperature soldering iron. If a static-free work station is unavailable, ground yourself before removing the MCT16463 from its protective packing to prevent static buildup from destroying the device.

Although an MGF140Z is specified, you can use other devices if you change the biasing resistors accordingly. Consult the references listed at the end of this project writeup before attempting a substitution. The MGF140Z is a fairly common transistor and is available from several of the suppliers listed in Chapter 33.

The general layout is shown in Fig. 57. Although BNC connectors were used here, Type-N or SMA connectors may also be employed. A number of ground feedthroughs are used at points indicated on the schematic diagram. These feedthroughs are necessary for stable operation and optimum performance; they must be used.

Ceramic chip capacitors are mandatory for the source bypass on the MCP1402. Do not attempt to substitute low-grade analog parts here! Chip capacitor provide a low-impedance source ground; this is of particular importance for stable operation with high-gain devices such as the microwave $^3\text{Al}_2\text{O}_3$ SAW/SET used here. The MCP1402 is measured directly to the source bypass capacitors by its source leads. First, solder one end of each 0.1 pF capacitor to the ground plane. Then solder one source lead to each chip capacitor. See the *preliminary* project that appears earlier in this chapter for complete details of this mounting.

The output filter is similar to the one described in the local-oscillator section 16.2.2. Starting at

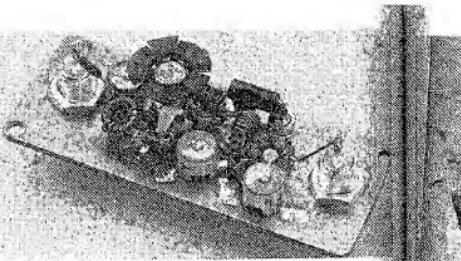


Fig. 80 -- Construction of the 22-MHz peck ammeter. On page 6 a previous model was given. The transmitter plate is tied to the ammeter, so the meter plate must be positioned away from the transmitter and receiver components.

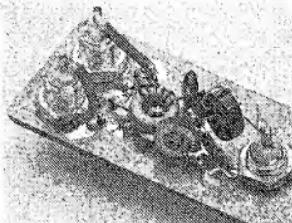


Fig. 69. — Closeup of the sucrose filter and dipper arm. PG-174 2006 is visible between the two filter support connections.

In this case, however, the coupling capacitor is a 0.3- to 3-pF trimmer. A toroidal coil is added for the 164-MHz image use.

28-MHz Post Amplifier
The 2N5109 post amplifier shown in Fig. 5B requires little special care. Note, however, the use of a phenolic-faced heat sink. Keep the heat sink away from the output board and other components since the 2N5109 case is tied to the transistor.

Yuanming Yuan

The receive mixer and diplexer filter may be housed in one enclosure, as shown in Fig. 39. The SRA-113 is best mounted on top of the circuit board with the pins protruding through to the component side.

Sharpenly mark and drill eight holes using

a no. 30 drill bit. All holes on top of the board are deburred with a 1/8-inch file, then the bit is used to remove the copper from around the hole. This allows ample clearance where leads are close to touching the board. Vectors the help of pins 1, 2, 4 and 8 on the component side of the board. The other pins are ground and should be soldered directly to the circuit board.

Transmit Converter

Construction of the vegetal wall requires a little extra planning for two main reasons because of the number of trees involved. Position the SRA-1 and the irrigation system to allow sufficient room for the growing components. It is better to have extra room than to be cramped for space. Refer to Fig. 60 for information on layout.

20 - The
Rhine

26. If any
is, Start by
removing the
main J1 and
the filter be-
tween J1 and
J2. Do an
initial 300-
ohm balanced
transistor
bridge to the
main stage
input. If the
second stage
is fully up, "W
will be able to
read 1000 ohms
in place of
100 ohms.
It reads: on
one case an
open plane.
Xeroderic
is the adequate
one selected
and the
second stage
is balanced
and has 100
ohms each
other output
leads as an
input is used
in a hole in
the balanced
stage. A circuit
board is
about the
board. One
end of the
circuit board
is for Q5 is a
heat sink
circuit board
is the heat sink

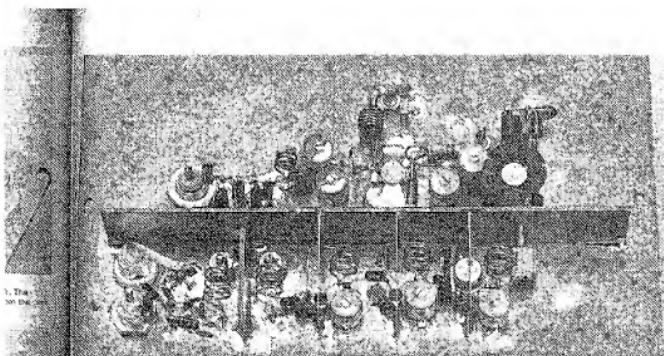


Fig. 10 - The front-panel converter incorporates shunt bypassing and shielding. J1 and J2 are of the bottom-left. Q1, Q2 and Q3 are arranged on the lower edge of the bracket, below the horizontal slot. Q4 and Q5 are above that slot; Q4 is to the right. The two shunt leads of Q6 are connected directly to the ground plane near the center of the panel. The coupling filter is between Q5 and the center bracket.

all six mounting holes as you go up, start by mounting the S.R.A. using paste technique described above. Then are J1 and J2, shield the mixer base-shield first, and then work stage-by-stage toward the output.

J1, Q2 and Q3 should be shielded by a U-shaped metal or sheet metal or shielded circuit-base material over the oscillator. Care a U-shaped notch in shield to clear the transistor case. It can be soldered directly to the base plate, and the leads are mounted "up-side-down" which Q1 and Q2 are mounted "up-side-up." Cut the Q3 and Q4 emitter lead in $\frac{1}{4}$ inch before soldering the diodes in place. Note that Q1 and Q2 have a lead out to the diodes directly in the resistor case and must be soldered to the lead plates. The Q3, however, is soldered to the diodes in the resistor case. To indicate where to solder, refer to the reference drawing. To indicate the distance between the case and the shield, Q4 must have a push-on heat sink. The heat sink should not cover any other components. Again, keep leads as short as possible.

Mount the diodes in the resistor case, a hole just large enough to seat the diode and transistor base through the heat shield. The emitter leads should extend flat on the component side of the board. Cut the collector and base leads off at the original length, while leaving the diode leads long. The lead for Q3 is made from a U-shaped piece of sheet metal, the same material used for base-board shields. Mount Q1 on top of heat sink for good thermal contact;

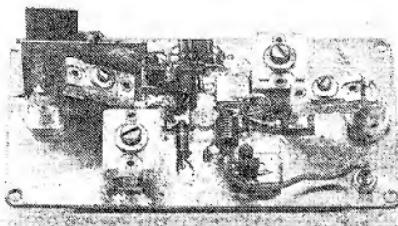


Fig. 11 - Solder the heat sink, but the 50W amplifier will fit inside a wave-dissipating box. Q1 is mounted on the bottom of the board. Input circuitry is to the left, output to the right. J1 and associated bias circuitry are behind the shielded brackets in J1.

solder the ground end of Di directly to the heat sink.

The value of R3 must be determined experimentally. Start with a 66 ohm, 2-W resistor. Measure the collector current of Q5 by inserting a milliammeter in the circuit at the cold end of L8. The collector current should be between 20 and 40 mA, and the value of R3 with proper bias is

the mixer input. Take the double-tuned R100 to 1000 ohms and 100 MHz to 100 MHz. If a spectrum analyzer is available, tune for a balance between maximum 220-MHz energy and minimum spurious output. Next, peak C1 through C3. Alternatively, peak C5 and C6 for maximum output. C7, C8, C9 and C10 are adjusted to the same values. A single-wattmeter may be used for tuning purposes, a spectrum analyzer with the full story. Two each stage for a compromise between output power and spectral purity.

Appeal 2007-4432
Application 09/980,430

Harmonics are 60-dB down after filtering. After you're through adjusting the measured power, power output should be 1 watt.

Power Amplifiers

The 10-W amplifier shown in Fig. 61 is mounted in its own diecast box. Ground feedthroughs are used beneath the 2N3906 emitter leads and at all varactor capacitor grounds. The LM317 regulator IC must be attached to a heat sink. Bias should be adjusted for a galvanic current of 40 to 50 mA.

C5, C6 and C7 are Unidico matched-lead book-mica capacitors. These capacitors provide an excellent low-impedance RF ground and are designed to work at high-current points. For stable operation, it is important that you use book-mica capacitors at these points.

The heat sink is fashioned from two U-shaped pieces of aluminum sheet. Be careful when mounting the heat sink; lateral pressure on the 2N5946 and may break the transistor.

SALINOMERCS

The transverter modules are arranged on a chassis as shown in Figs. 46 and 62. Short runs of 50-ohm coaxial cable interconnect the units. Most of the dc power wiring is run through the chassis.

The 144/220-MHz transverter represents a low-cost, modern approach to getting on the VHF bands. Circuit construction is straightforward, and the design makes use

Fig. 40 -- The transmit converter is mounted in a suitable position of the chassis, connected down. Do for the transmit, and repeat claimed to connect to VFO K2 and from there to a band switch as stated from the basic steps to each module.

of commercially available parts. The modular construction approach offers flexibility for easy troubleshooting and experimentation.

whose encouragement made this possible.

References

Hatch, High Frequency Circuit Design, 2nd Ed., UK: Research Publishing Co., Inc., 1988.
Keyward, Introduction to Human-Friendly Design, Englewood Cliffs, NJ: Prentice-Hall, Inc., 1992.

Spectral luminosity function methods. This can lead to inaccurate total magnitudes and "fogging". The don't work. The luminosities in a single, are very accurate, but the averaging of images degrades them. The filter luminous functions to produce a corrected for convolution's behavior are: Proper filter, Sinc-convolved outside in, 1.6-MX, and a "fudge factor".

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